REMARKS

In the last Office Action, the Examiner withdrew claims 13-18 from further consideration as being directed to a non-elected invention. Claim 19 was objected to as containing an informality. Claims 1, 2 and 8-10 were rejected under 35 U.S.C. §112, second paragraph, for indefiniteness. Claims 1-3, 6-9 and 19-20 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,841,126 to Fossum et al. ("Fossum"). Claims 1, 4, 5 and 10-12 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,320,616 to Sauer. Additional art was cited of interest.

In accordance with the present response, the specification has been suitably revised to correct informalities and to bring it into better conformance with U.S. practice. Original independent claims 1 and 10 have been amended to further patentably distinguish from the prior art of record and to overcome the rejection under 35 U.S.C. §112, second paragraph. Original claims 1, 3, 5-7 and 10-12 have also been amended in formal respects to improve the wording and bring them into better conformance with U.S. practice. Claims 2, 4, 8, 9 and 19-20 have been canceled without prejudice or admission, thereby rendering the corresponding objection, indefiniteness rejection, and prior art rejection of these claims moot. Non-elected claims 13-18 have been canceled without prejudice or admission and subject to

applicant's right to file a continuing application to pursue the subject matter of the non-elected claims. New claims 21-23 have been added to provide a fuller scope of coverage. A new abstract which more clearly reflects the invention to which the amended and new claims are directed has been substituted for the original abstract.

Applicant requests reconsideration of his application in light of the foregoing amendments and the following discussion.

The present invention relates to a signal processing circuit, an image sensor IC utilizing the signal processing circuit, and a signal processing method.

As described in the specification (pgs. 1-6), conventional signal processing circuits, such as image sensors, are associated with high fixed pattern noise and output signals with limited range.

The present invention overcomes the drawbacks of the conventional art. Figs. 1-9 show an embodiment of a signal processing circuit according to the present invention embodied in the claims. The signal processing circuit has a sample/hold circuit 21 for sampling an input signal (e.g., via input terminal VIN) comprised of a first signal and a second signal and for holding the first signal. The first signal comprises an optical signal obtained due to storage of electric charges generated due to light incident upon a

photoelectric converter (Fig. 7). The second signal comprises a reference signal obtained due to resetting of the photoelectric converter. A subtracter 24 receives an output signal of the sample/hold circuit 21 and the input signal and obtains a difference between the output signal of the sample/hold circuit 21 and the input signal. A voltage clamp circuit 25 clamps a part or all of an output signal from the subtracter 24. By this construction, fixed pattern noise is reduced, and it becomes possible to widen an effective range of an output signal of the signal processing circuit.

The prior art of record does not disclose or suggest the subject matter recited in amended claims 1, 3, 5-7, 10-12 and newly added claims 21-23.

Claims 1, 3, 6 and 7 were rejected under 35 U.S.C. §102(b) as being anticipated by Fossum. Claims 1, 5 and 10-12 were rejected under 35 U.S.C. §102(b) as being anticipated by Sauer. Applicant respectfully traverses these rejections and submits that Fossum and Sauer do not disclose or describe the subject matter recited in corresponding amended claims 1, 3, 5-7 and 10-12.

Independent claim 1 is directed to a signal processing circuit and requires a sample/hold circuit that samples an input signal comprised of a first signal and a second signal and for holding the first signal, the first signal comprising an optical signal obtained due to storage of

electric charges generated due to light incident upon a photoelectric converter, and the second signal comprising a reference signal obtained due to resetting of the photoelectric converter. Amended claim 1 further requires a subtracter connected to receive an output signal of the sample/hold circuit and the input signal and for obtaining a difference between the output signal of the sample/hold circuit and the input signal, and a voltage clamp circuit for clamping a part or all of an output signal from the subtracter.

Fossum discloses a CMOS active pixel sensor type imaging system having a signal processing circuit which includes holding capacitors 510, 512, DDS 520, COL 522, 524, and transistors 550, 552 (Figs. 5A-5B). Sauer discloses a CMOS image sensor including a transistor SH, capacitors C1, C2, nodes 156, 157, transistor M5, and clamp line CL. However, Fossum and Sauer do not disclose or describe the specific structural and functional combination of the sample/hold circuit, subtracter and voltage clamp circuit recited in amended independent claim 1. For example, Fossum and Sauer do not disclose or describe that the input signal sampled by the sample/hold circuit comprises an optical signal obtained due to storage of electric charges generated due to light incident upon a photoelectric converter, and a reference signal obtained due to resetting of the photoelectric

converter, as recited in amended claim 1.

Amended independent claim 10 is directed to an image sensor and requires a photoelectric converter, and a signal processing circuit comprising a sample/hold circuit for sampling an input signal comprised of an optical signal obtained due to storage of electric charges generated due to light incident upon the photoelectric converter, and a reference signal obtained due to resetting of the photoelectric converter. Again, no corresponding structural and functional combination is disclosed or described by Fossum and Sauer.

In the absence of the foregoing disclosure recited in amended independent claims 1 and 10, anticipation cannot be found. See, e.g., W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) ("Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration"); Continental Can Co. USA v. Monsanto Co., 20 USPQ2d 1746, 1748 (Fed. Cir. 1991) ("When more than one reference is required to establish unpatentability of the claimed invention anticipation under § 102 can not be found".); Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 221 USPQ 481, 485 (Fed. Cir. 1984) (emphasis added) ("Anticipation requires the presence in a single prior art reference disclosure of each and every element of the

claimed invention, arranged as in the claim").

Stated otherwise, there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. This standard is clearly not satisfied by Fossum and Sauer for the reasons stated above. Furthermore, Fossum and Sauer do not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify Fossum's imaging system or Sauer's image sensor to arrive at the claimed invention.

Claims 1, 3, 5-7 and 10-12 depend on and contain all of the limitations of amended independent claims 1 and 10, respectively, and, therefore, distinguish from Fossum and Sauer at least in the same manner as claims 1 and 10.

In view of the foregoing, applicant respectfully requests that the rejection of claims 1, 3, 6 and 7 under 35 U.S.C. §102(b) as being anticipated by Fossum and the rejection of claims 1, 5 and 10-12 under 35 U.S.C. §102(b) as being anticipated by Sauer be withdrawn.

Applicant respectfully submits that newly added claims 21-23 also patentably distinguish from the prior art of record.

New independent claim 21 is directed to a signal processing method corresponding to the signal processing circuit of amended independent claim 1. Claim 21 recites the

steps of generating an input signal comprised of an optical signal component obtained due to storage of electric charges generated due to light incident upon a photoelectric converter and a reference signal component obtained due to resetting of the photoelectric converter, sampling the input signal and holding the optical signal component of the input signal using a sample/hold circuit, obtaining a difference between an output signal of the sample/hold circuit and the input signal using a subtracter, and clamping a part or all of an output signal from the subtracter using a voltage clamp circuit. No corresponding combination of steps is disclosed or suggested by the prior art of record.

Claims 22 and 23 depend on and contain all of the limitations of independent claim 21 and, therefore, distinguish from the prior art of record at least in the same manner as claim 21.

In view of the foregoing amendments and discussion, the application is believed to be in allowable form. Accordingly, favorable reconsideration and allowance of the claims are most respectfully requested.

Respectfully submitted,

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July 7, 2006
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